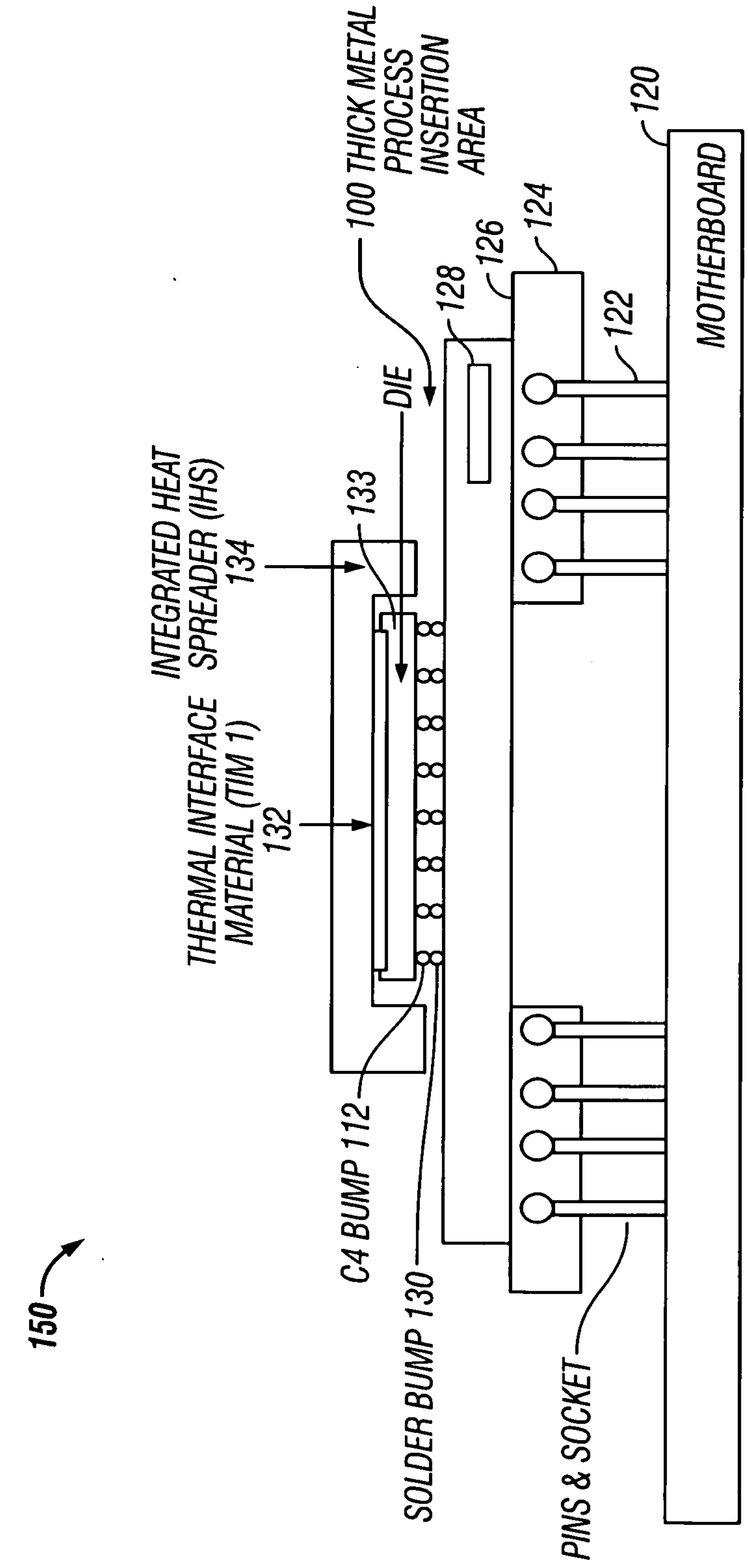
100 THICK METAL PROCESS INSERTION AREA
120
MOTHERBOARD
124
126
128
122
DIE
133
INTEGRATED HEAT SPREADER (IHS) 134
THERMAL INTERFACE MATERIAL (TIM 1) 132
C4 BUMP 112
SOLDER BUMP 130
PINS & SOCKET
150

FIG. 1A

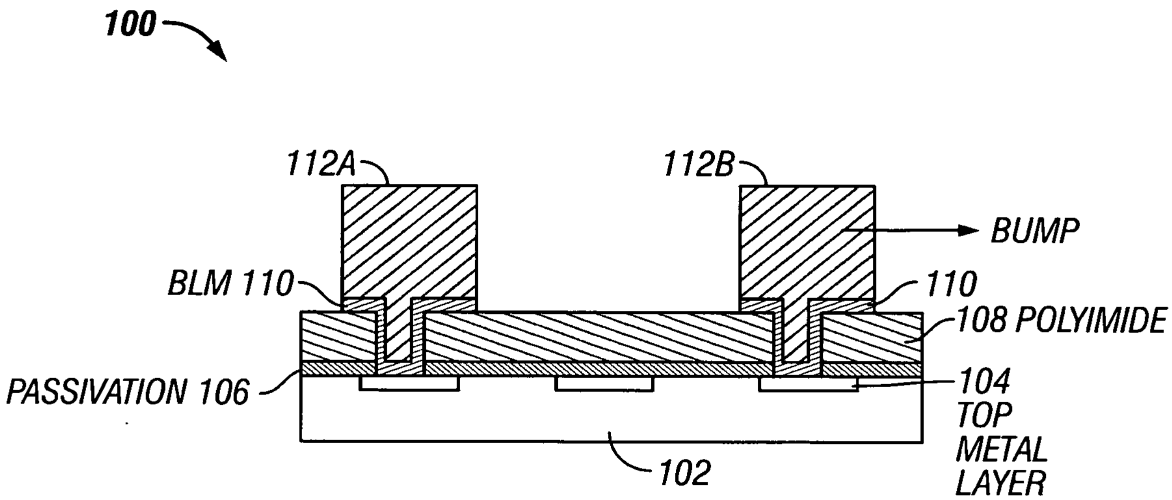
100
112A
112B
BUMP
BLM 110
110
108 POLYIMIDE
PASSIVATION 106
104
TOP
METAL
LAYER
102

FIG. 1B

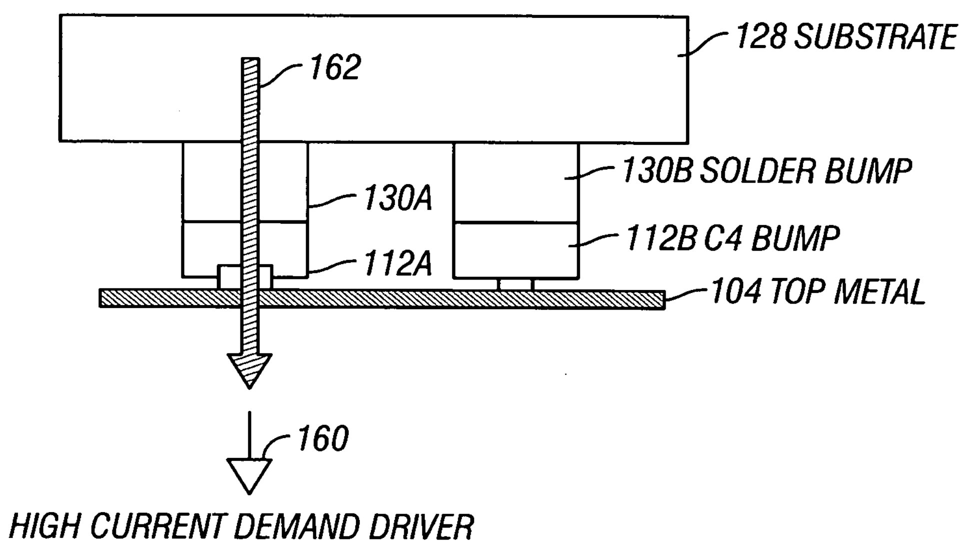
128 SUBSTRATE
162
130B SOLDER BUMP
130A
112B C4 BUMP
112A
104 TOP METAL
160
HIGH CURRENT DEMAND DRIVER

FIG. 1C

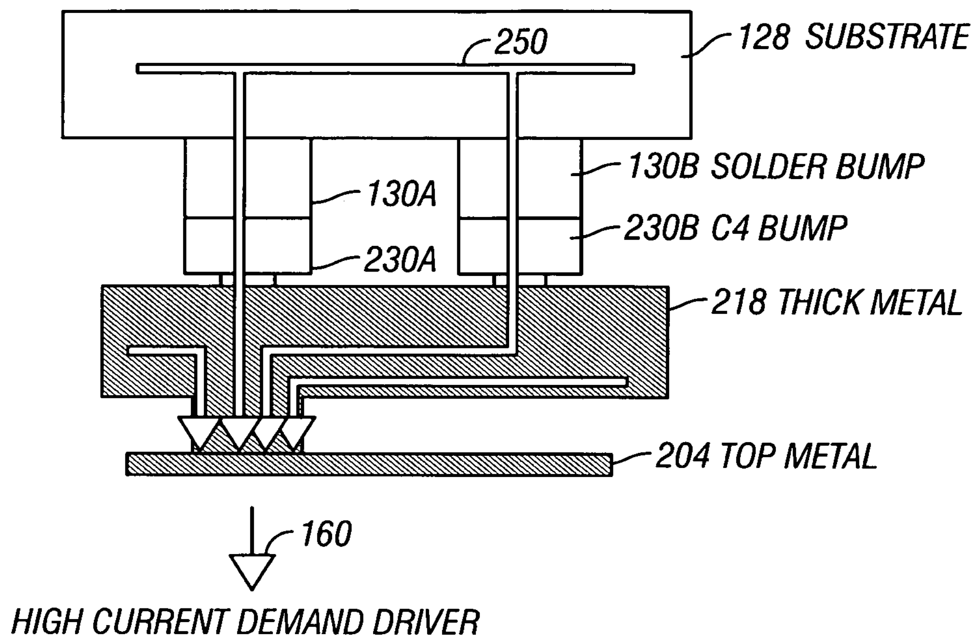
250
128 SUBSTRATE
130B SOLDER BUMP
130A
230B C4 BUMP
230A
218 THICK METAL
204 TOP METAL
160
HIGH CURRENT DEMAND DRIVER

FIG. 1D

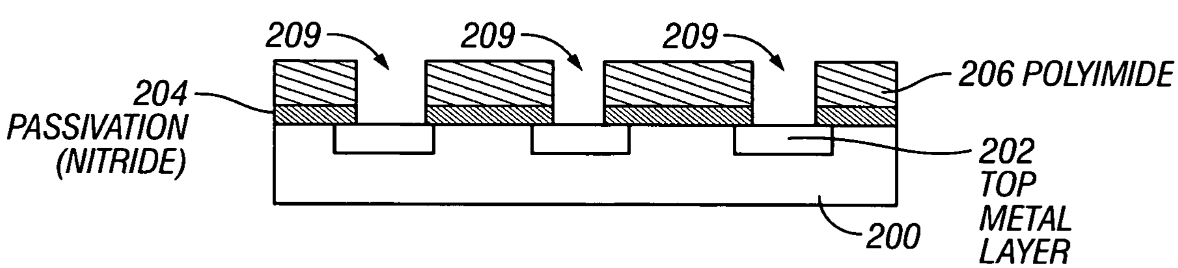
209
209
209
204
PASSIVATION
(NITRIDE)
206 POLYIMIDE
202
TOP
METAL
LAYER
200

FIG. 2

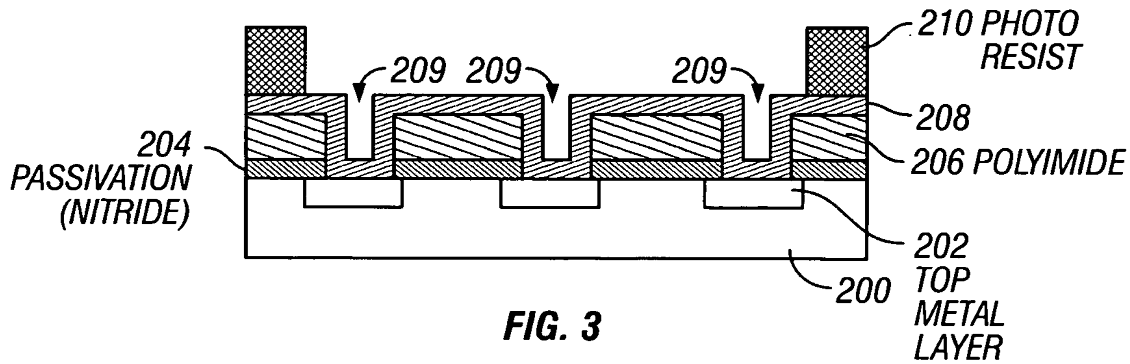

FIG. 3

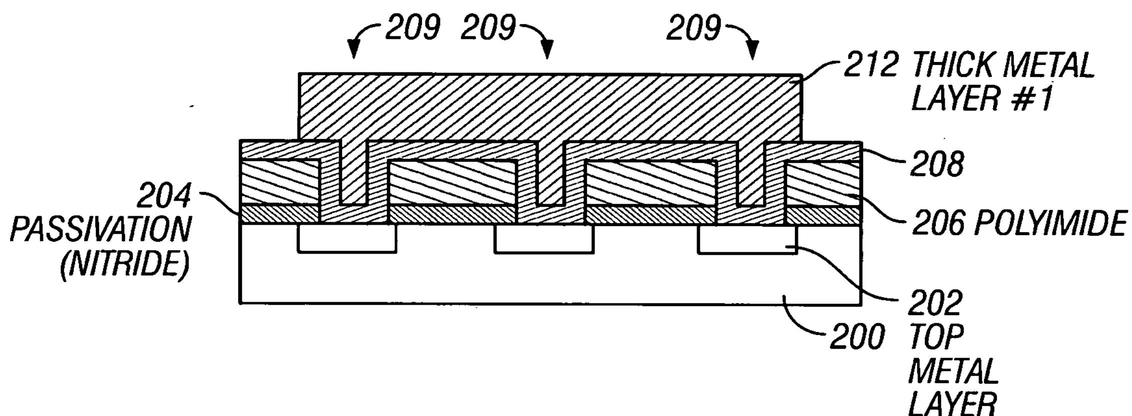

FIG. 4

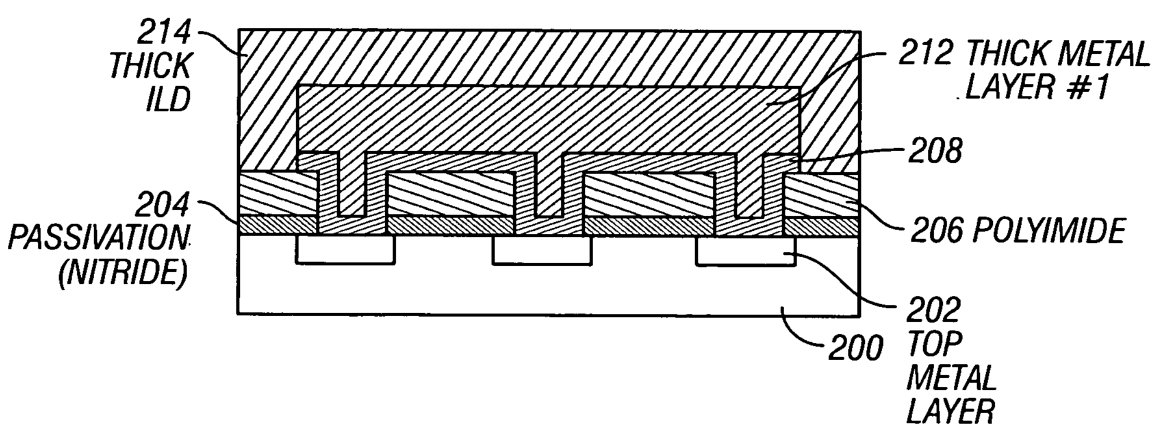

FIG. 5

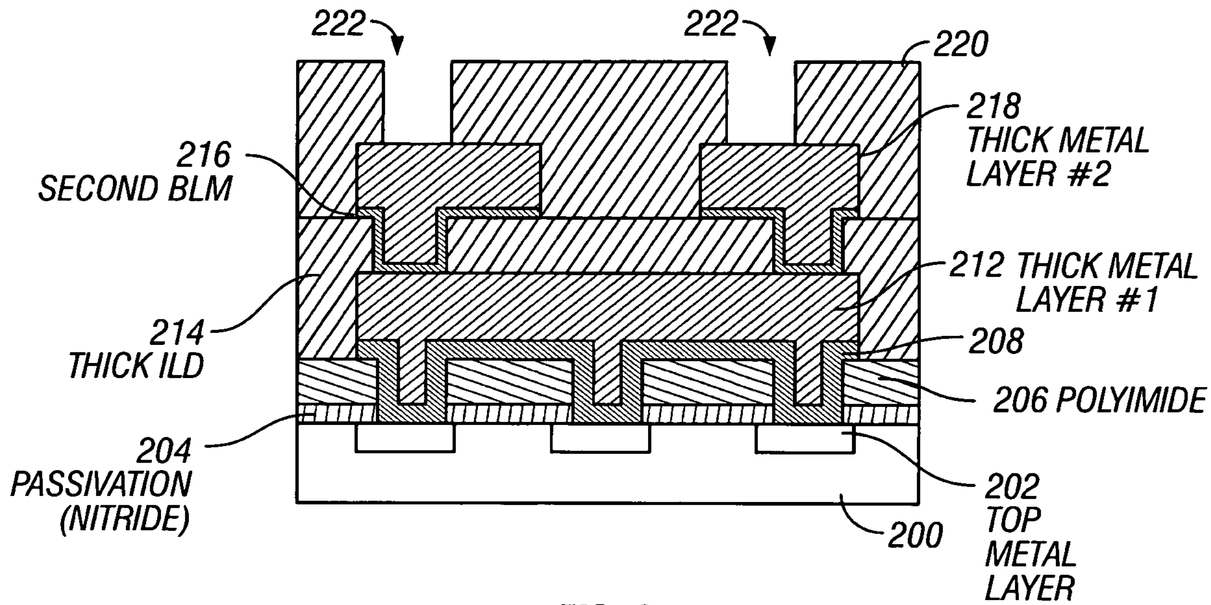
222
222
220
218
THICK METAL
LAYER #2
216
SECOND BLM
212 THICK METAL
LAYER #1
214
THICK ILD
208
206 POLYIMIDE
204
PASSIVATION
(NITRIDE)
202
TOP
METAL
LAYER
200

FIG. 6

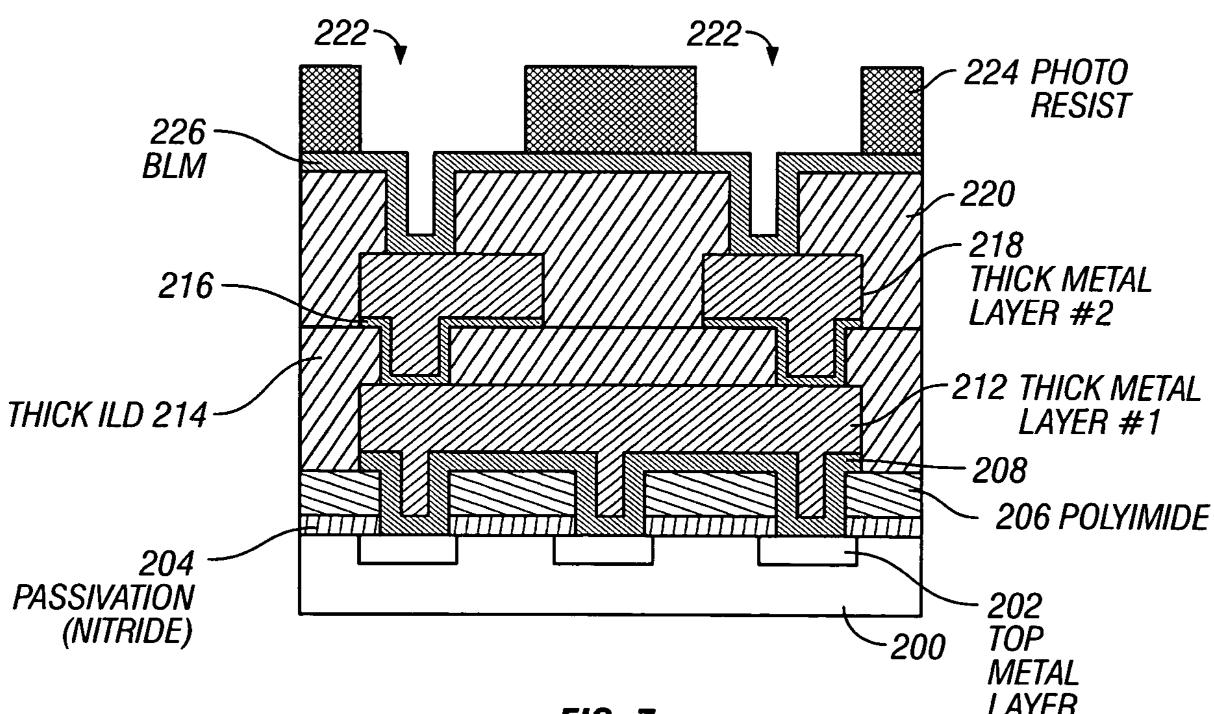
222
222
224 PHOTO
RESIST
226
BLM
220
218
THICK METAL
LAYER #2
216
THICK ILD 214
212 THICK METAL
LAYER #1
208
206 POLYIMIDE
204
PASSIVATION
(NITRIDE)
202
TOP
METAL
LAYER
200

FIG. 7

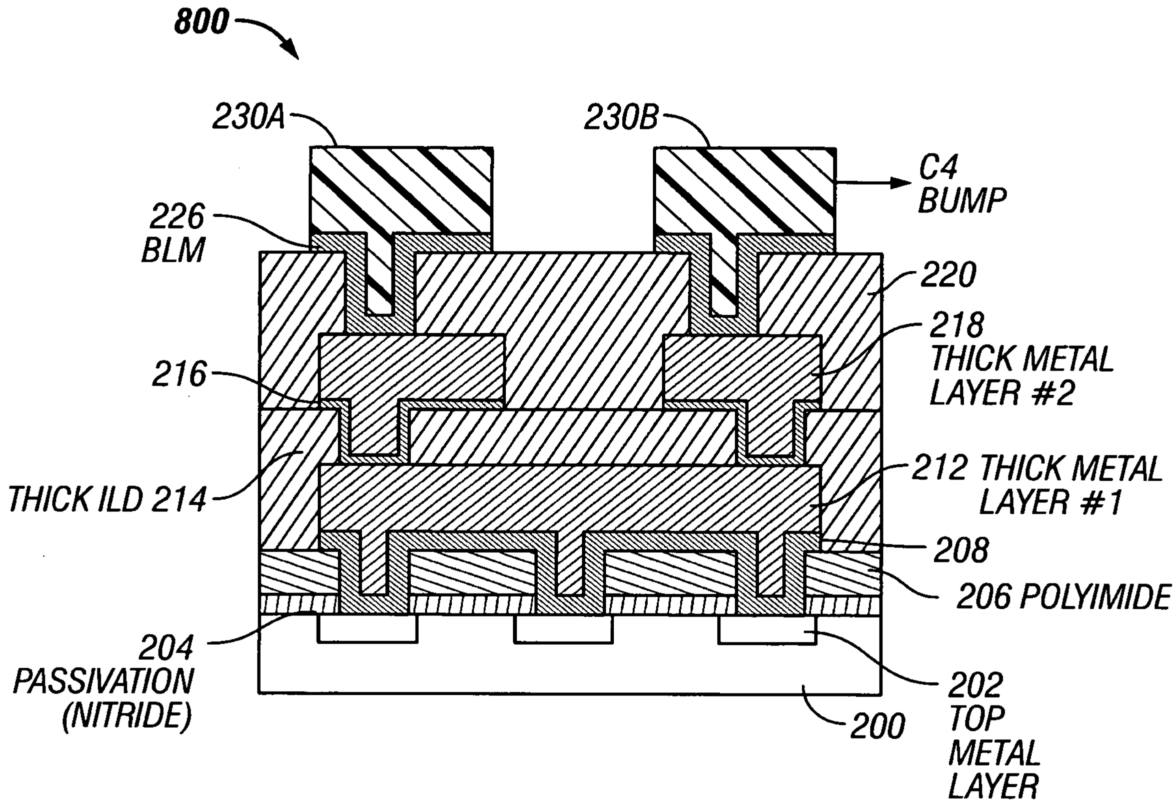
800
230A
230B
C4
BUMP
226
BLM
220
218
THICK METAL
LAYER #2
216
THICK ILD 214
212 THICK METAL
LAYER #1
208
206 POLYIMIDE
204
PASSIVATION
(NITRIDE)
202
TOP
METAL
LAYER
200

FIG. 8A

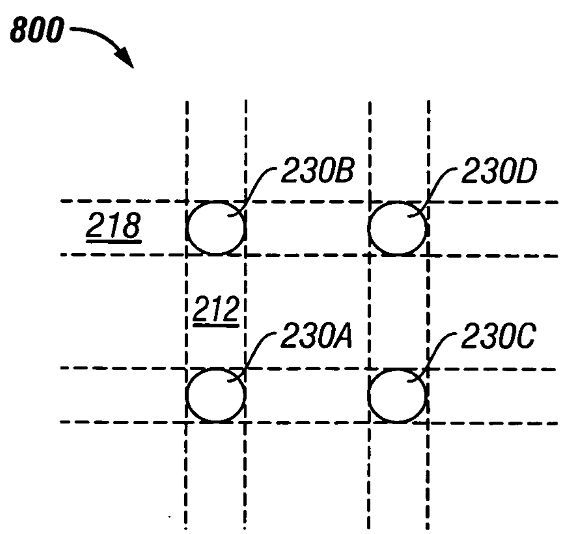
800
230B
230D
218
212
230A
230C

FIG. 8B

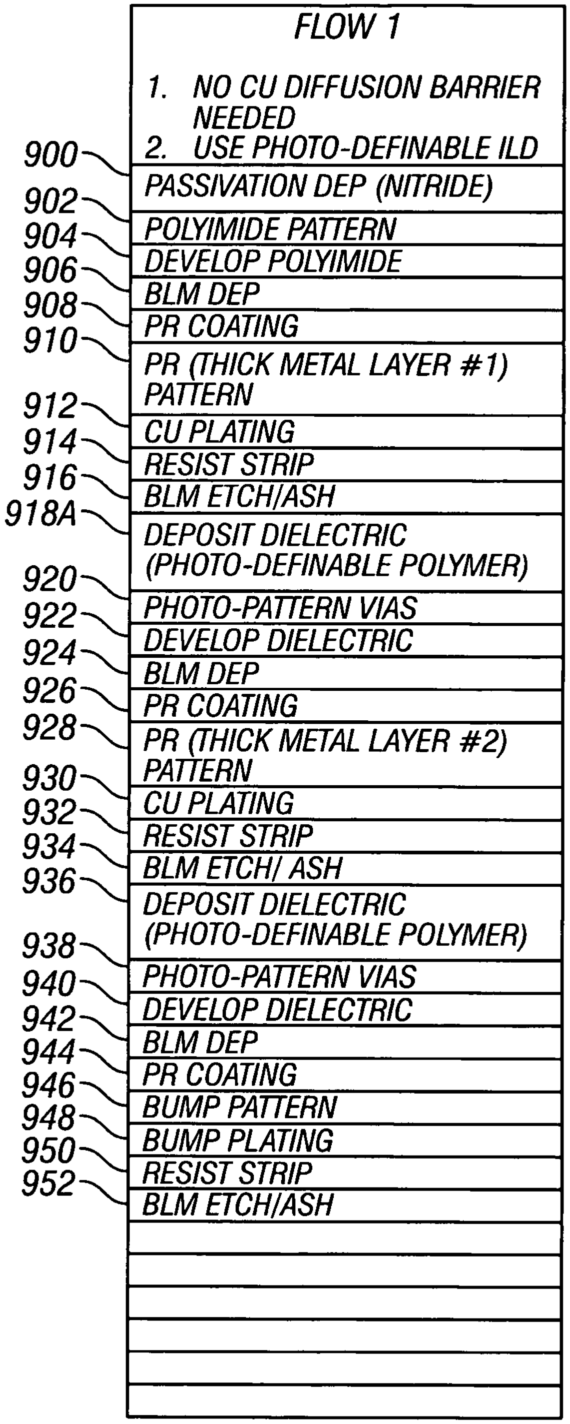
FLOW 1
1. NO CU DIFFUSION BARRIER NEEDED
2. USE PHOTO-DEFINABLE ILD
900 PASSIVATION DEP (NITRIDE)
902 POLYIMIDE PATTERN
904 DEVELOP POLYIMIDE
906 BLM DEP
908 PR COATING
910 PR (THICK METAL LAYER #1) PATTERN
912 CU PLATING
914 RESIST STRIP
916 BLM ETCH/ASH
918A DEPOSIT DIELECTRIC (PHOTO-DEFINABLE POLYMER)
920 PHOTO-PATTERN VIAS
922 DEVELOP DIELECTRIC
924 BLM DEP
926 PR COATING
928 PR (THICK METAL LAYER #2) PATTERN
930 CU PLATING
932 RESIST STRIP
934 BLM ETCH/ ASH
936 DEPOSIT DIELECTRIC (PHOTO-DEFINABLE POLYMER)
938 PHOTO-PATTERN VIAS
940 DEVELOP DIELECTRIC
942 BLM DEP
944 PR COATING
946 BUMP PATTERN
948 BUMP PLATING
950 RESIST STRIP
952 BLM ETCH/ASH

FIG. 9A

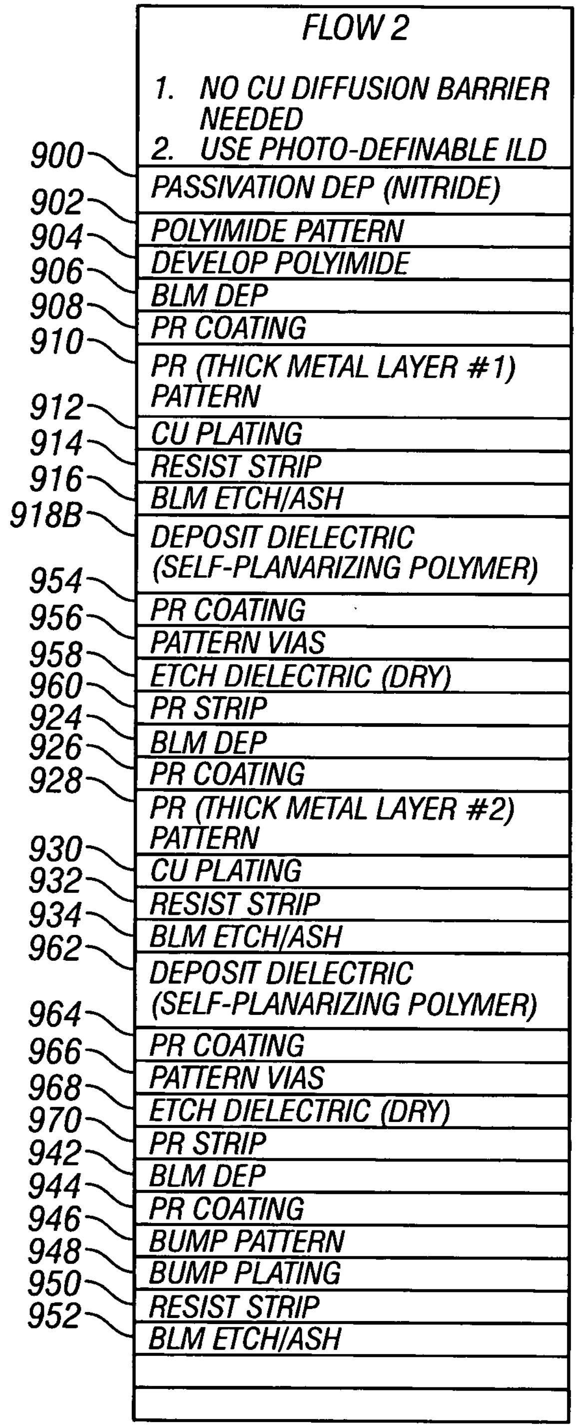
FLOW 2
1. NO CU DIFFUSION BARRIER NEEDED
2. USE PHOTO-DEFINABLE ILD
900 PASSIVATION DEP (NITRIDE)
902 POLYIMIDE PATTERN
904 DEVELOP POLYIMIDE
906 BLM DEP
908 PR COATING
910 PR (THICK METAL LAYER #1) PATTERN
912 CU PLATING
914 RESIST STRIP
916 BLM ETCH/ASH
918B DEPOSIT DIELECTRIC (SELF-PLANARIZING POLYMER)
954 PR COATING
956 PATTERN VIAS
958 ETCH DIELECTRIC (DRY)
960 PR STRIP
924 BLM DEP
926 PR COATING
928 PR (THICK METAL LAYER #2) PATTERN
930 CU PLATING
932 RESIST STRIP
934 BLM ETCH/ASH
962 DEPOSIT DIELECTRIC (SELF-PLANARIZING POLYMER)
964 PR COATING
966 PATTERN VIAS
968 ETCH DIELECTRIC (DRY)
970 PR STRIP
942 BLM DEP
944 PR COATING
946 BUMP PATTERN
948 BUMP PLATING
950 RESIST STRIP
952 BLM ETCH/ASH

FIG. 9B

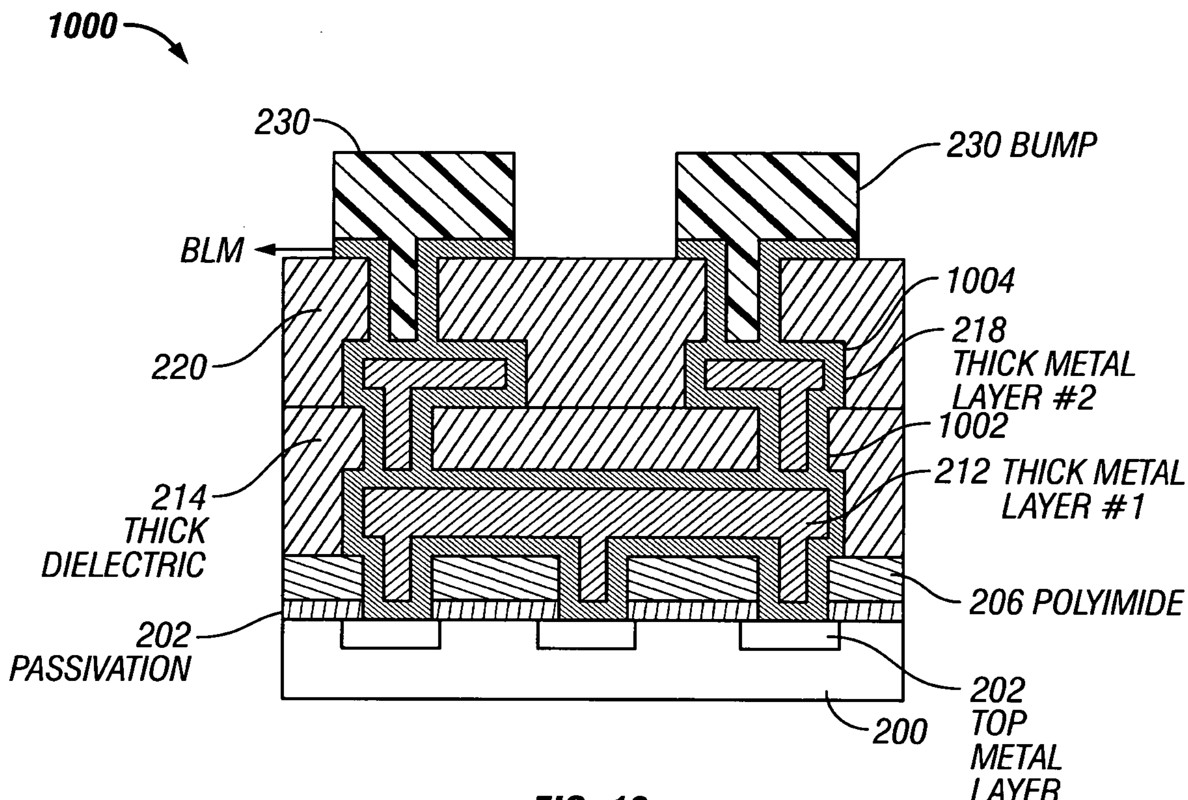
1000
230
230 BUMP
BLM
1004
220
218
THICK METAL
LAYER #2
1002
214
THICK
DIELECTRIC
212 THICK METAL
LAYER #1
206 POLYIMIDE
202
PASSIVATION
202
TOP
METAL
LAYER
200

FIG. 10

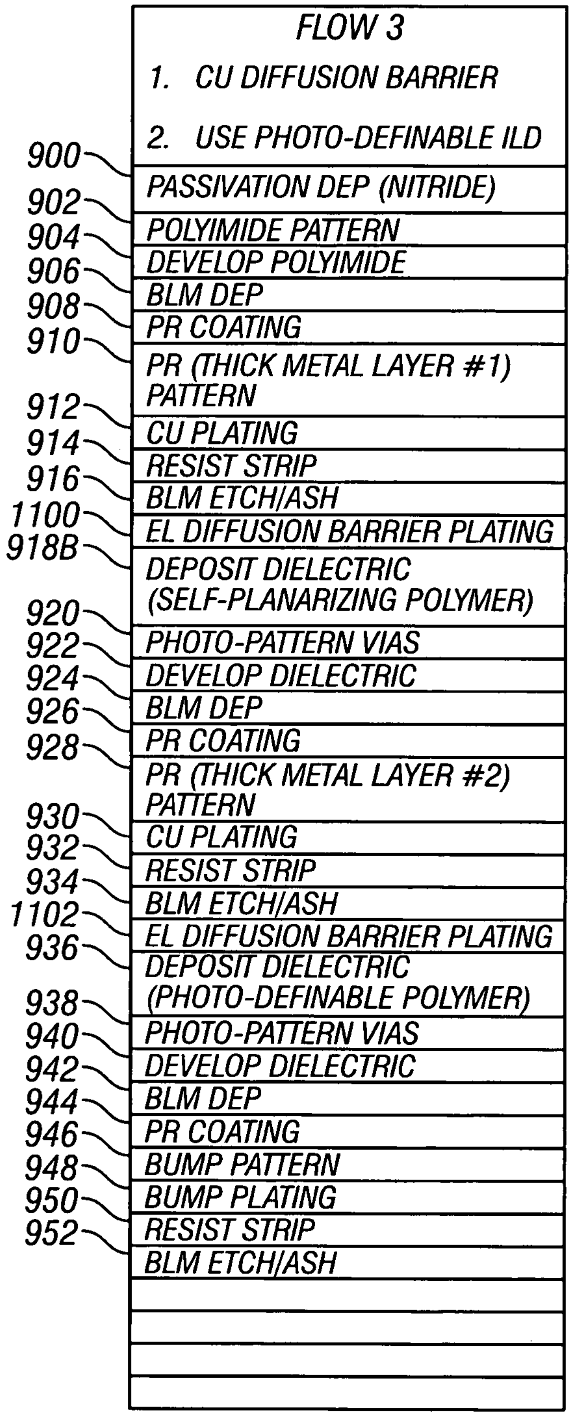

FIG. 11A

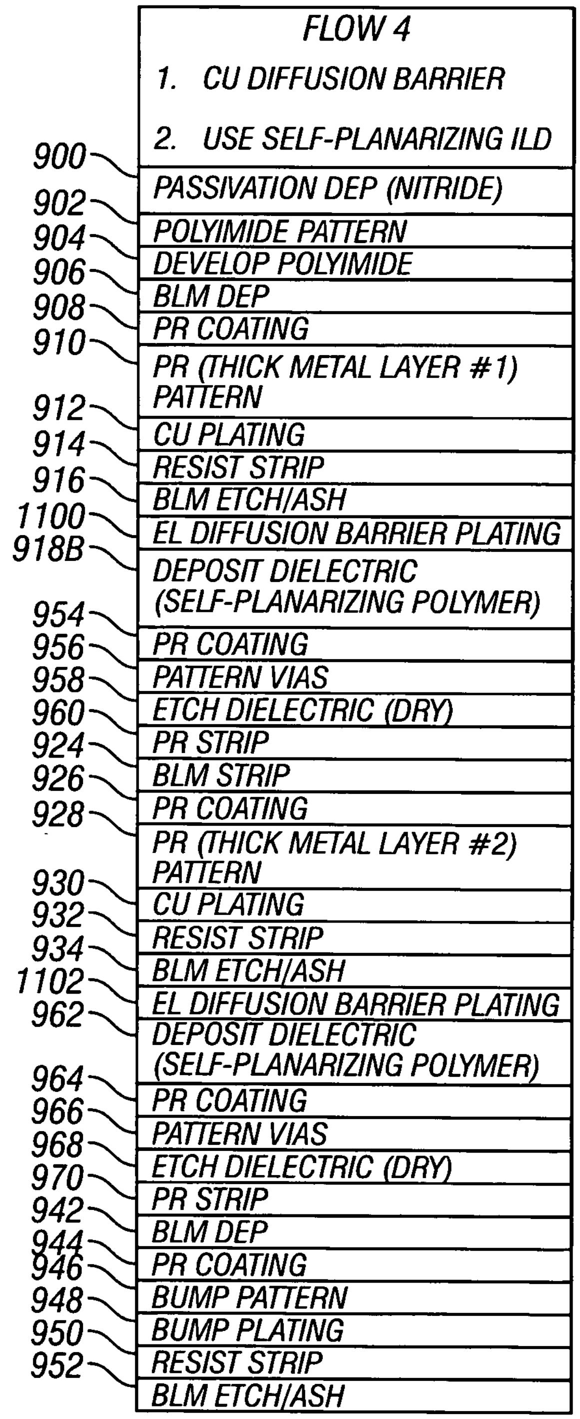

FIG. 11B

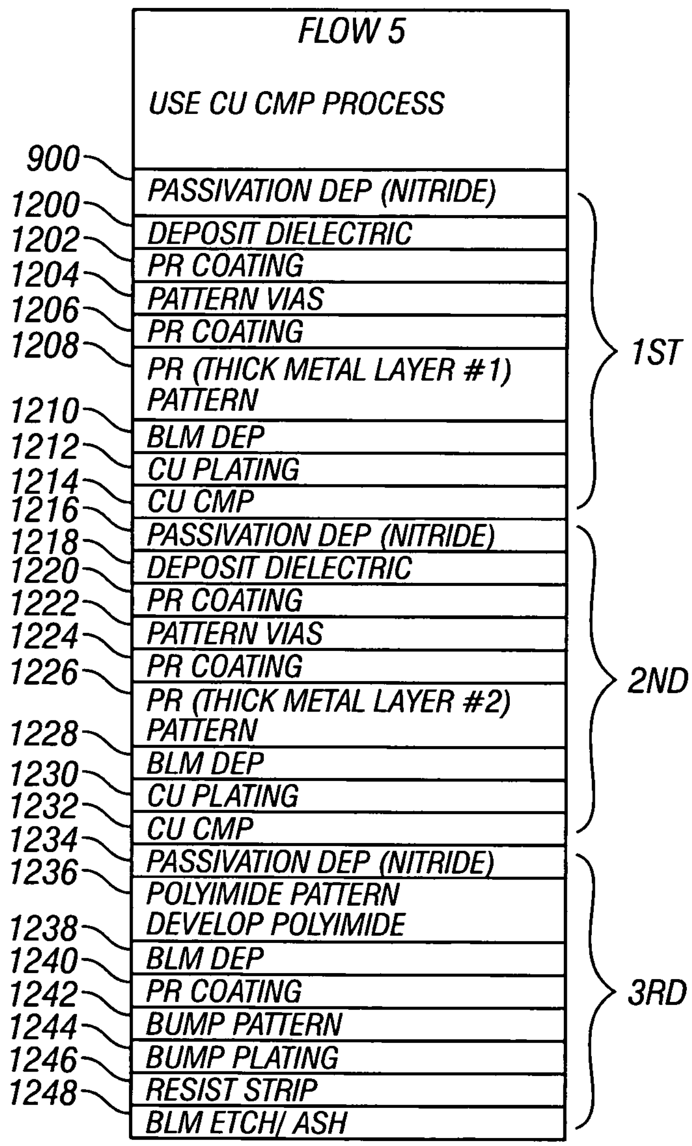
FLOW 5
USE CU CMP PROCESS
900
PASSIVATION DEP (NITRIDE)
1200
DEPOSIT DIELECTRIC
1202
PR COATING
1204
PATTERN VIAS
1206
PR COATING
1208
PR (THICK METAL LAYER #1) PATTERN
1210
BLM DEP
1212
CU PLATING
1214
CU CMP
1216
PASSIVATION DEP (NITRIDE)
1218
DEPOSIT DIELECTRIC
1220
PR COATING
1222
PATTERN VIAS
1224
PR COATING
1226
PR (THICK METAL LAYER #2) PATTERN
1228
BLM DEP
1230
CU PLATING
1232
CU CMP
1234
PASSIVATION DEP (NITRIDE)
1236
POLYIMIDE PATTERN DEVELOP POLYIMIDE
1238
BLM DEP
1240
PR COATING
1242
BUMP PATTERN
1244
BUMP PLATING
1246
RESIST STRIP
1248
BLM ETCH/ ASH
1ST
2ND
3RD

FIG. 12

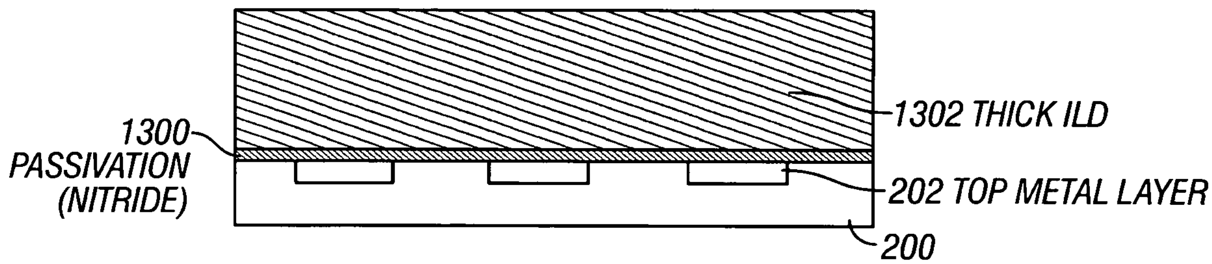

FIG. 13A

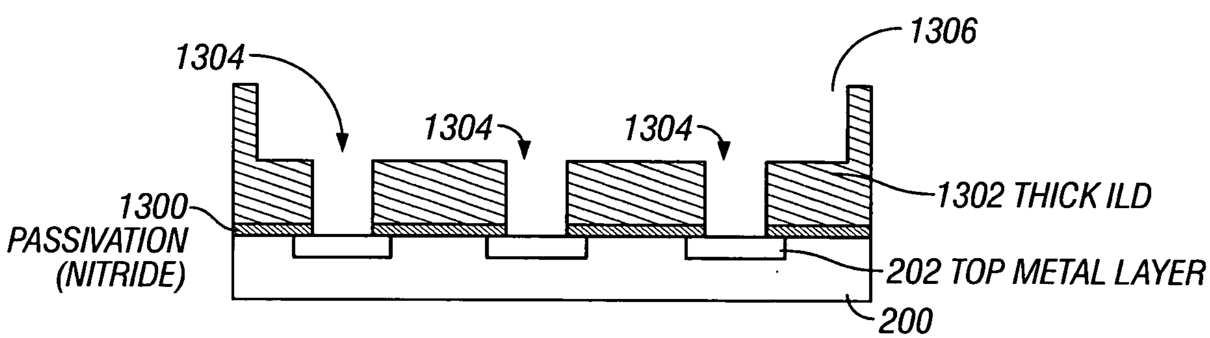

FIG. 13B

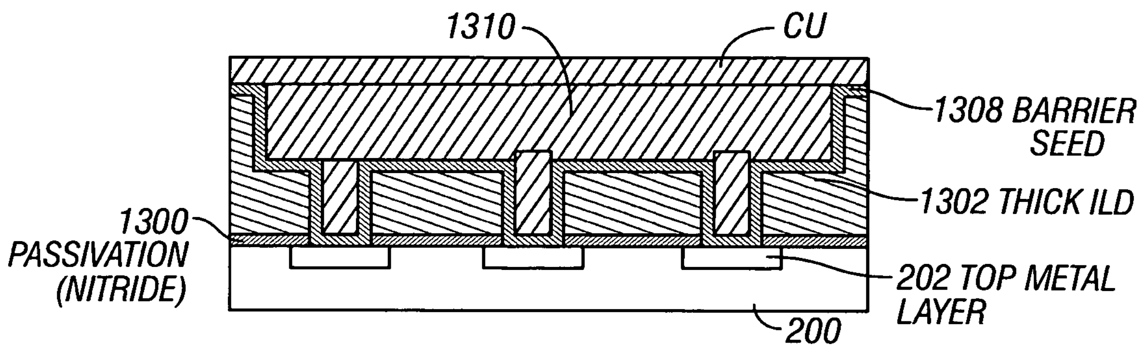

FIG. 13C

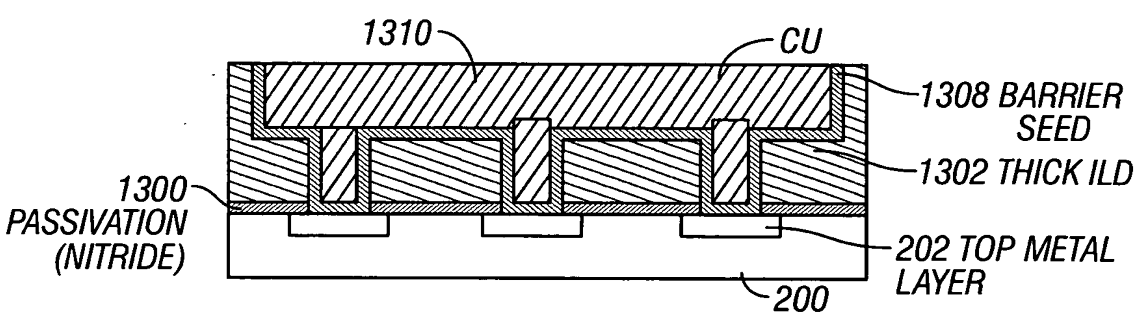

FIG. 13D

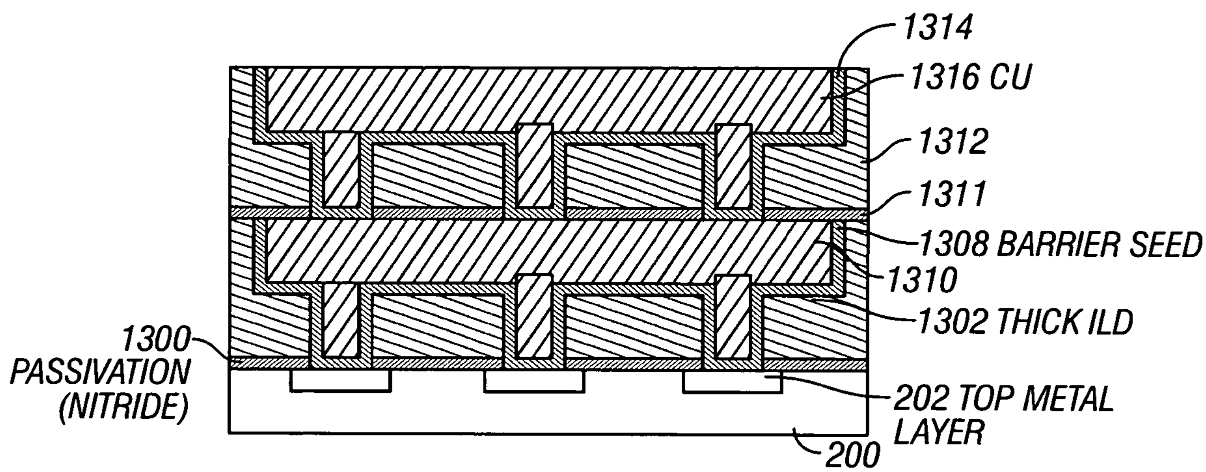

FIG. 13E

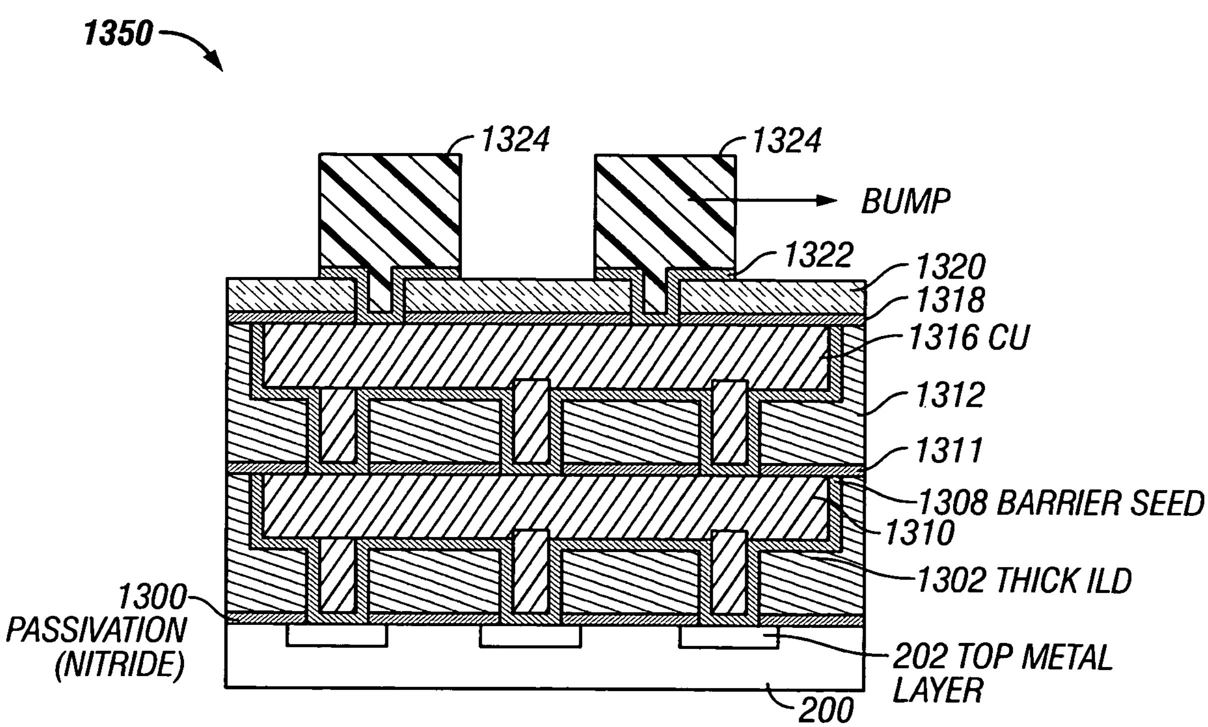

FIG. 13F

	SIMULATION PARAMETERS			RESULTS	
	ADDITION THICK METAL LAYERS	METAL WIDTH	VIA RESISTANCE (MΩ)	IMAX (MA)	IR DROP (MV)
1410	DEFAULT (PRESENT STATE OF ART)			680	29
1400	TWO 45 μM THICK METAL LAYERS	70 μM FOR METAL LAYER #2 100 μM FOR METAL LAYER #1	0.7	430 (36% IMAX IMPROVEMENT)	30
1402	TWO 15 μM THICK METAL LAYERS	70 μM FOR METAL LAYER #2 100 μM FOR METAL LAYER #1	0.7	530 (22% IMAX IMPROVEMENT)	30
1404	TWO 45 μM THICK METAL LAYERS	70 μM FOR METAL LAYER #2 100 μM FOR METAL LAYER #1	70	370 (46% IMAX IMPROVEMENT)	49
1406	TWO 15 μM THICK METAL LAYERS	70 μM FOR METAL LAYER #2 100 μM FOR METAL LAYER #1	70	380 (44% IMAX IMPROVEMENT)	51

FIG. 14

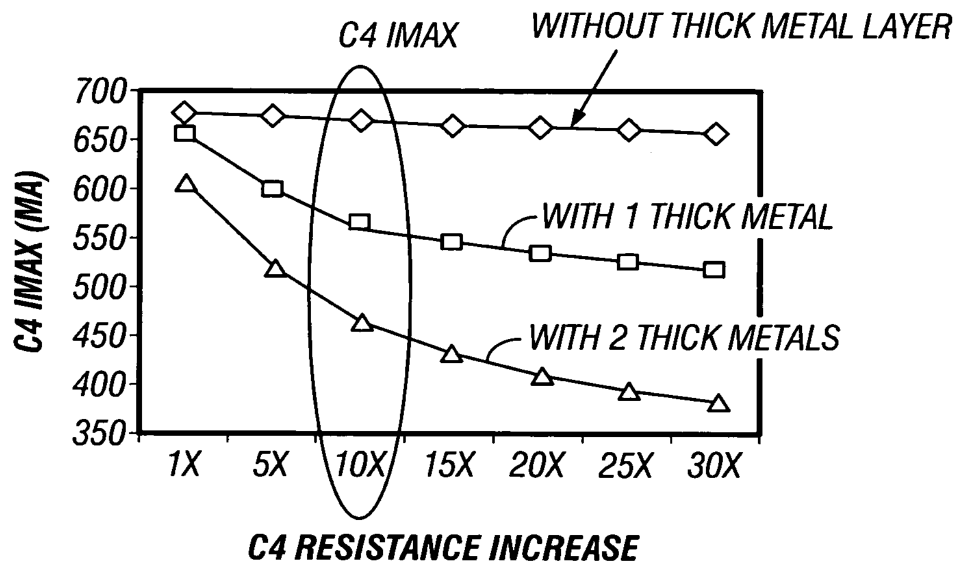

FIG. 15A

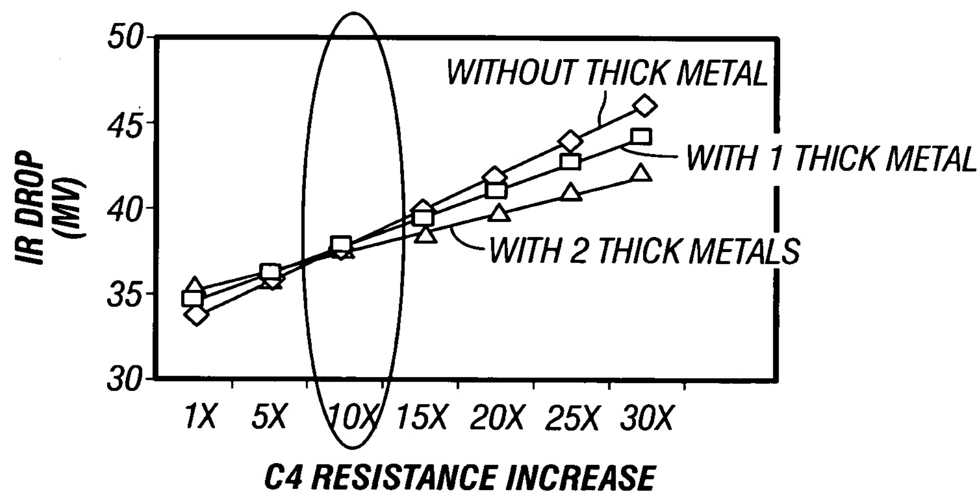

FIG. 15B

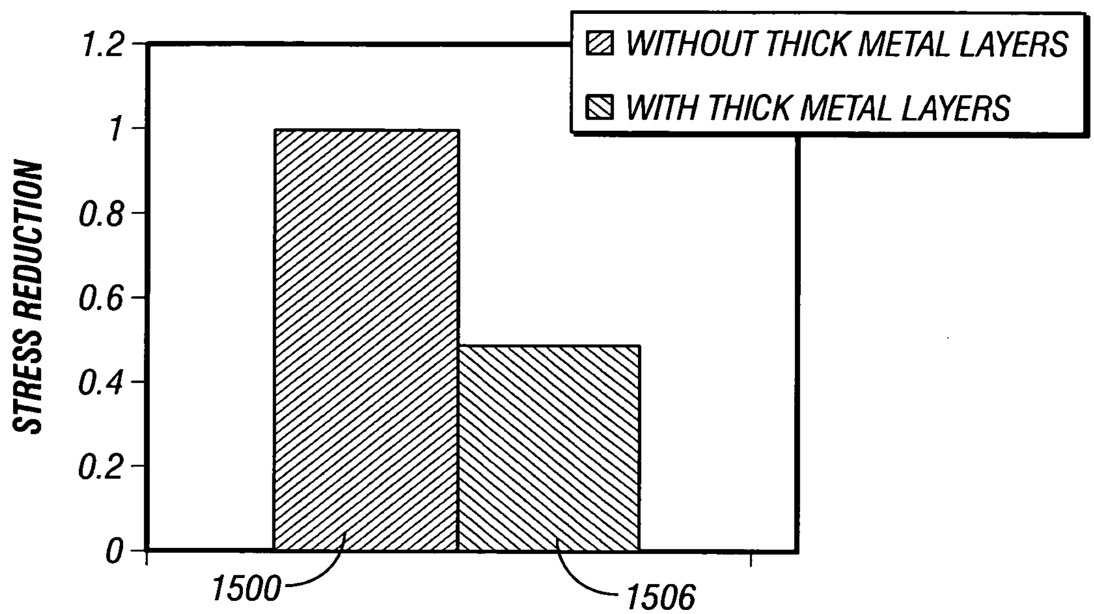
WITHOUT THICK METAL LAYERS
WITH THICK METAL LAYERS
STRESS REDUCTION
1.2
1
0.8
0.6
0.4
0.2
0
1500
1506

FIG. 16